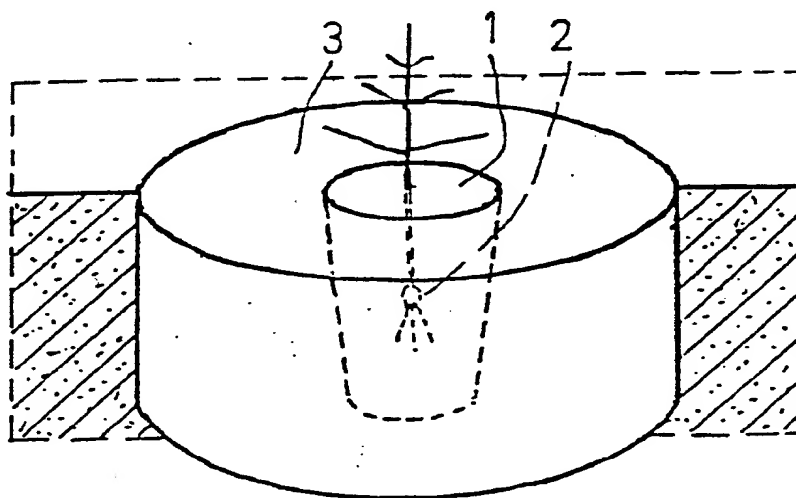




## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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(54) Title: A METHOD FOR CULTIVATING PLANTS



## (57) Abstract

A method for cultivating plants in which in a first cultivating stage a seed (2) is germinated or a cutting is planted for further growth in a minor quantity of cultivating medium under relatively qualified conditions, e.g. in a greenhouse, and in which in a subsequent second cultivating stage the plant produced by germination or the developed cutting is replanted in a further cultivating medium and permitted to grow under less qualified conditions. The cultivating medium used in the first cultivating stage comprises a relatively small shape-stable plug-like body (1) of cultivating medium. Subsequent to the seed (2) germinating or the cutting developing to a desired extent, the shaped-stable plug-like body (1) of cultivating medium is placed in a recess formed in a larger shape-stable body (3) of cultivating medium comprising a particulate aggregate of compressed cellulose fibres of high density, exhibiting micropores capable of absorbing water and defining air permeable macropores therebetween.

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A method for cultivating plants

The present invention relates to a method for cultivating plants, in which in a first cultivating stage a seed is germinated or a cutting is caused to grow in a small quantity of cultivating medium under relatively qualified conditions, e.g. in a greenhouse, and in which in a second cultivating stage the germinated plant or the developed cutting, subsequent to being re-planted in another cultivating medium, are permitted to grow under less qualified conditions.

Such a method forms part of the prior art. When practising this known method, small limbs of given plants are inserted into a particulate cultivating medium, for example soil, enclosed in a small paper or plastics container, and caused to grow under relatively qualified conditions of the kind requiring the use of expensive environments in the form of greenhouses, which must be heated by supplying some form of energy. As soon as the cutting has grown to the extent desired in each particular case, the resultant plant is replanted in a further space separate from the first space, for example in the open air in separate beds, and in there allowed to grow before being placed on the growing site where the plant is intended to grow. The conditions required in respect of the second or further space are less qualified than those required for the first space, in that no energy is required in the second space for maintaining determined temperature differences. The reason for dividing the growth period of the plant into two stages, is that the cuttings during that part of their growth period during which they are most sensitive and during which growth conditions must be more accurately controlled than otherwise, shall take up as little space as possible in the relatively expensive environmental space in which they are nurtured. The method is also irrational, since the transplantation of the plants, i.e. the transfer of cuttings grown in the first stage to the place where they are further

brought on, requires much manual labour. The paper or plastics casing around the cultivating medium in the first growth stage must be removed by hand and the residual plant together with its soil-encased roots must be transported to a further site and there planted in different soil.

It has now been found possible to avoid these disadvantages, or to substantially reduce the same, when the cultivating medium used in the first growth stage comprises a relatively small shape-stable plug-like body of cultivating substrate, and when, subsequent to the seed germinating and producing growth or subsequent to the cutting developing to the extent desired, the shape-stable plug-like body of cultivating substrate is placed in a recess formed in a larger shape-stable body of cultivating substrate for continued growth of the plant, the cultivating substrates used comprising a particulate aggregate of high density, exhibiting micropores capable of taking-up water and defining therebetween air permeable macropores. The particles are preferably obtained by compressing hydrophilic organic fibres to the aforesaid high density.

The invention will now be described in more detail with reference to the accompanying drawing, in which

Figure 1 illustrates a plug-like body of cultivating medium in which a seed is caused to germinate,

Figure 2 illustrates a disc of the same cultivating medium as that in Figure 1, provided with a recess for receiving the plug illustrated in Figure 1, and

Figure 3 illustrates the plug of Figure 1 inserted into the disc of Figure 2.

In Figure 1 there is illustrated a plug-like, shape-stable body 1 of cultivating medium comprising a particulate aggregate obtained by compressing cellulose fibres, the particles exhibiting micropores capable of absorbing water, under the action of capillary forces, and defining therebetween macropores which form a structure of through-passing, air permeable passages. There is initially inserted into the plug-like body 1 a seed 2, for example a forestry plant seed

whereafter the body 1 is placed in a greenhouse in which temperature and air humidity can be controlled. The seed is brought to germination, by supplying suitable quantities of water and nutrient thereto. Bodies containing non-germinated seed are optionally removed from the greenhouse. As soon as the seed has germinated and the subsequent plant growth has stabilized and the plant become sufficiently hardy to withstand less qualified environmental conditions outdoors, the plug-like body 1 together with the plant rooted therein is transplanted in the larger cultivating body 3 illustrated in Figure 2, said cultivating body having formed therein to this end a recess 4, such that the composite body obtains the appearance illustrated in Figure 3. This larger, composite body can then be placed in a bed and the space around the periphery of the body filled with soil. The composite body is then allowed to remain in the bed until the plant has grown to an extent which renders the plant suitable for planting in its final planting site. The composite body, however, is preferably placed on an earth foundation in which an air space is presented between the said earth foundation and the underside of the composite body. In this case the larger cultivating body 3 may be encased in a moisture-retaining thermoplastic casing or a casing made of some other suitable material. Because both the plug-like cultivating body 1 and the larger cultivating body 3 are shape-stable, i.e. do not lose their shape or form, it is much easier to handle the bodies mechanically during transplanting operations.

The cultivating medium from which the shape-stable bodies 1 and 3 are formed comprises compressed aggregates of cellulose fibres obtained from coniferous trees. The dimensions of the aggregate are adjusted so that the composite cultivating medium obtains a given porosity, with pores having a mean pore size of between 30 and 300  $\mu\text{m}$ . The density of the cellulose fibres is such that the mean pore size of the inner pores lies at about 10-30  $\mu\text{m}$ . The high degree of compression to which the fibres

are subjected and the intrinsic properties of the material limits the extent to which the material can take-up water, so that even when heavily watered the body of cultivating medium will retain its structure while ensuring that

5 sufficient water is retained in the smaller pores without preventing air from reaching the roots to any appreciable extent. The larger pores have substantially non-capillary dimensions, and thus form a suitable drainage system which enables water in the substrate to be adequately replenished

10 for development of the plant roots. An important feature of the invention resides in the combination of the long-term ability of the cultivating body to absorb water through the capillary and colloidal system of the dense part of the cultivating body, together with the possibility of replenishing the water through the system of larger pores, while

15 substantially retaining the shape and form of the cultivating body.

CLAIMS

1. A method for cultivating plants, in which in a first cultivating stage a seed is caused to germinate or a cutting to grow in a small quantity of cultivating medium under relatively qualified conditions, for example in a greenhouse, and whereafter the plant obtained through germination or the developed cutting is transplanted in a second cultivating stage in a different cultivating medium and grown under less qualified conditions, characterized by using as a cultivating medium in the first cultivating stage a relatively small, shape-stable plug-like body of cultivating medium; permitting the seed or the cutting in said plug-like body to grow to a desired extent; transferring the form-stable, plug-like body of cultivating medium to a recess in a larger shape-stable body of cultivating medium for continued growth of the plant or cutting, said cultivating media comprising a particulate aggregate comprising compressed cellulose fibres of relatively high density, said particles exhibiting micropores having a mean pore size of between about 10 and 30  $\mu\text{m}$ , and are capable of absorbing and retaining water, these micropores defining therebetween air-permeable macropores having a mean pore size of between 30 and 300  $\mu\text{m}$ .

2. A method according to Claim 1, characterized in that the composite cultivating body obtained subsequent to transplanting the rooted plant in the second cultivating stage is placed with an air gap located between the underside of the body and a supporting surface.

3. A method according to Claim 1, characterized in that the larger shape-stable body is enclosed in a casing which will not permit moisture to escape therethrough.

1/1

FIG. 1

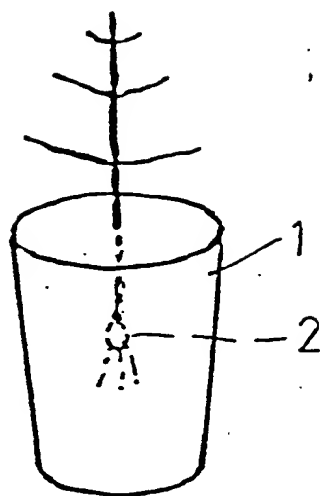


FIG. 2

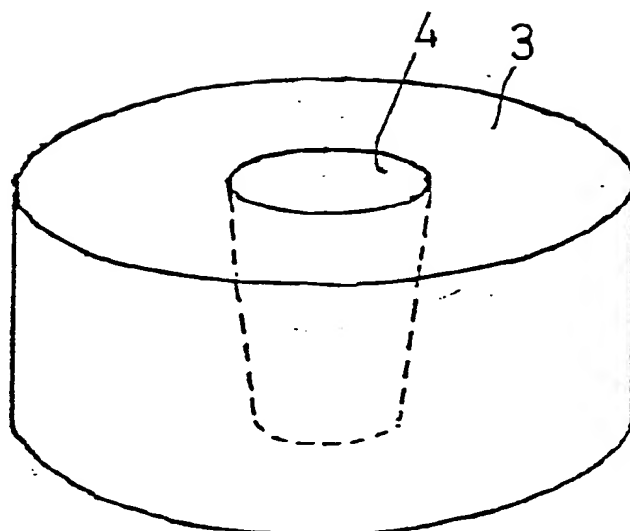
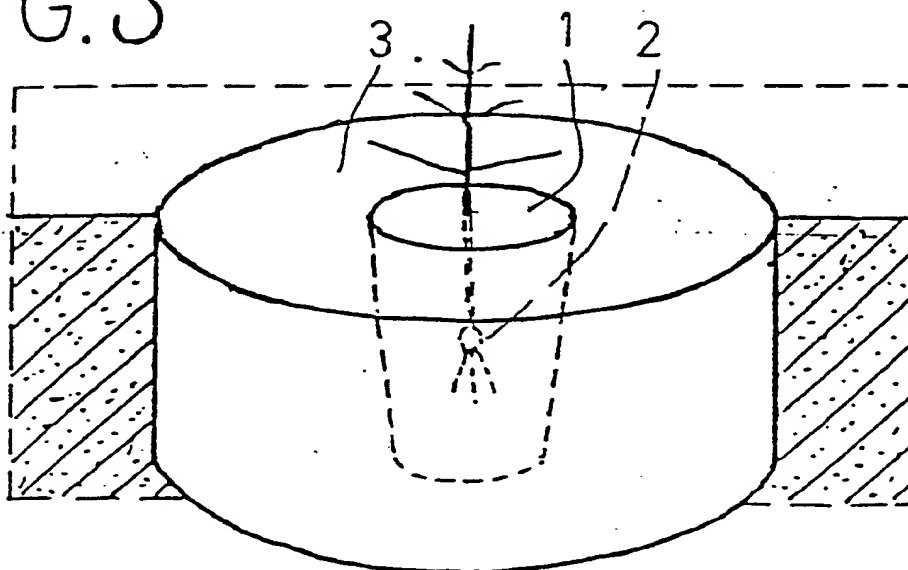


FIG. 3





# INTERNATIONAL SEARCH REPORT

International Application No PCT/SE85/00023

<b>I. CLASSIFICATION OF SUBJECT MATTER</b> (if several classification symbols apply, indicate all) <sup>8</sup> According to International Patent Classification (IPC) or to both National Classification and IPC 4 <div style="text-align: center; font-family: monospace; font-size: 1.2em;">A 01 G 9/00, 9/19</div>														
<b>II. FIELDS SEARCHED</b> <div style="text-align: center; font-size: 0.8em;">Minimum Documentation Searched <sup>7</sup></div> <table style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 25%; border-bottom: 1px solid black; font-size: 0.8em;">Classification System</th> <th style="border-bottom: 1px solid black; font-size: 0.8em;">Classification Symbols</th> </tr> <tr> <td style="vertical-align: top; padding: 5px;">           IPC 4 US C1         </td> <td style="vertical-align: top; padding: 5px;">           A 01 G 1/00, 7/00, 9/00, 02, 10, 31/00, 02            47:58, 66, 73-77; 71:23, 24         </td> </tr> </table> <div style="text-align: center; font-size: 0.8em; margin-top: 5px;">           Documentation Searched other than Minimum Documentation            to the extent that such Documents are included in the Fields Searched <sup>6</sup> </div> <div style="text-align: center; padding: 10px 0;">           SE, NO, DK, FI classes as above         </div>			Classification System	Classification Symbols	IPC 4 US C1	A 01 G 1/00, 7/00, 9/00, 02, 10, 31/00, 02 47:58, 66, 73-77; 71:23, 24								
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IPC 4 US C1	A 01 G 1/00, 7/00, 9/00, 02, 10, 31/00, 02 47:58, 66, 73-77; 71:23, 24													
<b>III. DOCUMENTS CONSIDERED TO BE RELEVANT <sup>1</sup></b> <table style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 10%; border-bottom: 1px solid black; font-size: 0.8em;">Category <sup>9</sup></th> <th style="border-bottom: 1px solid black; font-size: 0.8em;">Citation of Document, <sup>11</sup> with indication, where appropriate, of the relevant passages <sup>12</sup></th> <th style="border-bottom: 1px solid black; font-size: 0.8em;">Relevant to Claim No. <sup>13</sup></th> </tr> <tr> <td style="vertical-align: top; text-align: center; padding: 5px;">Y</td> <td style="padding: 5px;">           FR, A, 2 064 890 (FARBEN FABRIKEN BAYER AKTIEN-GESELLSCHAFT)            23 July 1971            &amp; NL, 7014375            DE, 1949462            GB, 1318736            BE, 756927            AT, 303436         </td> <td style="vertical-align: top; text-align: center; padding: 5px;">1-3</td> </tr> <tr> <td style="vertical-align: top; text-align: center; padding: 5px;">Y</td> <td style="padding: 5px;">           US, A, 3 834 072 (DAVID RACK)            17 September 1973            &amp; NL, 7008186            DE, 2025316            FR, 2049836            GB, 1296746            CA, 959282         </td> <td style="vertical-align: top; text-align: center; padding: 5px;">1-3</td> </tr> <tr> <td style="vertical-align: top; text-align: center; padding: 5px;">Y</td> <td style="padding: 5px;">           SE, B, 349 225 (AMERICAN CAN COMPANY)            25 September 1972  <div style="text-align: right; margin-top: 10px;">.../...</div> </td> <td style="vertical-align: top; text-align: center; padding: 5px;">1-3</td> </tr> </table>			Category <sup>9</sup>	Citation of Document, <sup>11</sup> with indication, where appropriate, of the relevant passages <sup>12</sup>	Relevant to Claim No. <sup>13</sup>	Y	FR, A, 2 064 890 (FARBEN FABRIKEN BAYER AKTIEN-GESELLSCHAFT) 23 July 1971 & NL, 7014375 DE, 1949462 GB, 1318736 BE, 756927 AT, 303436	1-3	Y	US, A, 3 834 072 (DAVID RACK) 17 September 1973 & NL, 7008186 DE, 2025316 FR, 2049836 GB, 1296746 CA, 959282	1-3	Y	SE, B, 349 225 (AMERICAN CAN COMPANY) 25 September 1972 <div style="text-align: right; margin-top: 10px;">.../...</div>	1-3
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<div style="display: flex; justify-content: space-between; font-size: 0.8em;"> <div style="width: 45%;"> <p><sup>10</sup> Special categories of cited documents:</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> </div> <div style="width: 45%;"> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"G" document member of the same patent family</p> </div> </div>														
<b>IV. CERTIFICATION</b> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; border-bottom: 1px solid black; font-size: 0.8em;">Date of the Actual Completion of the International Search</td> <td style="width: 50%; border-bottom: 1px solid black; font-size: 0.8em;">Date of Mailing of this International Search Report</td> </tr> <tr> <td style="text-align: center; padding: 5px;">1985-03-26</td> <td style="text-align: center; padding: 5px;">1985-03-28</td> </tr> <tr> <td style="border-bottom: 1px solid black; font-size: 0.8em;">International Searching Authority</td> <td style="border-bottom: 1px solid black; font-size: 0.8em;">Signature of Authorized Officer</td> </tr> <tr> <td style="text-align: center; padding: 5px;">Swedish Patent Office</td> <td style="text-align: center; padding: 5px;">             Ingrid Falk         </td> </tr> </table>			Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report	1985-03-26	1985-03-28	International Searching Authority	Signature of Authorized Officer	Swedish Patent Office	 Ingrid Falk				
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Swedish Patent Office	 Ingrid Falk													

## III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)

Category *	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No.
Y	GB, A, 2 004 531 (EDWARD BILLINGTON & SON LIMITED) 4 April 1979 & NL, 7809211 FR, 2402401	1-3